



Development of new a material for sea water substructures by seawater electrolysis

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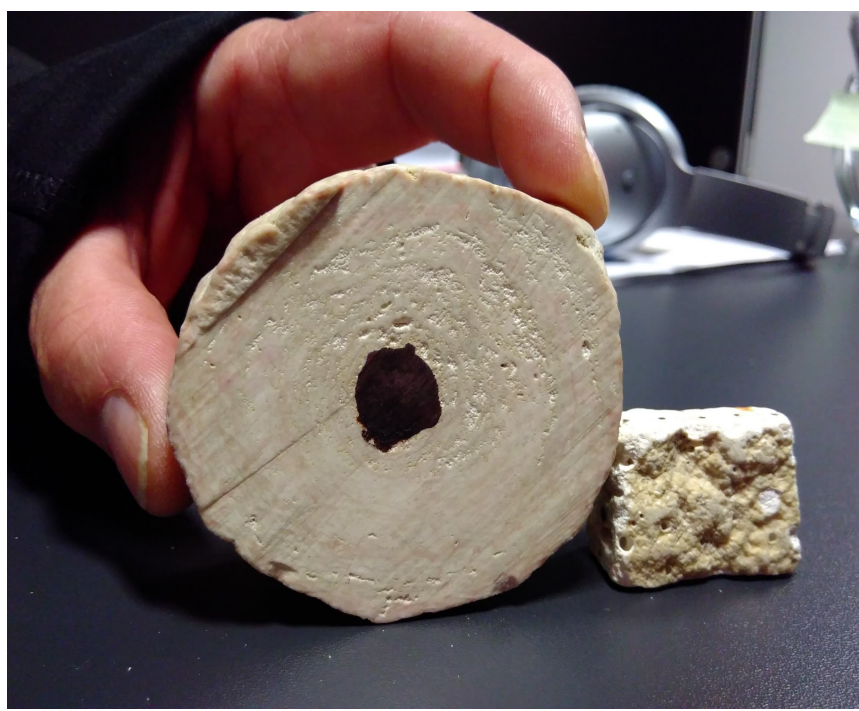


01

INTRODUCTION

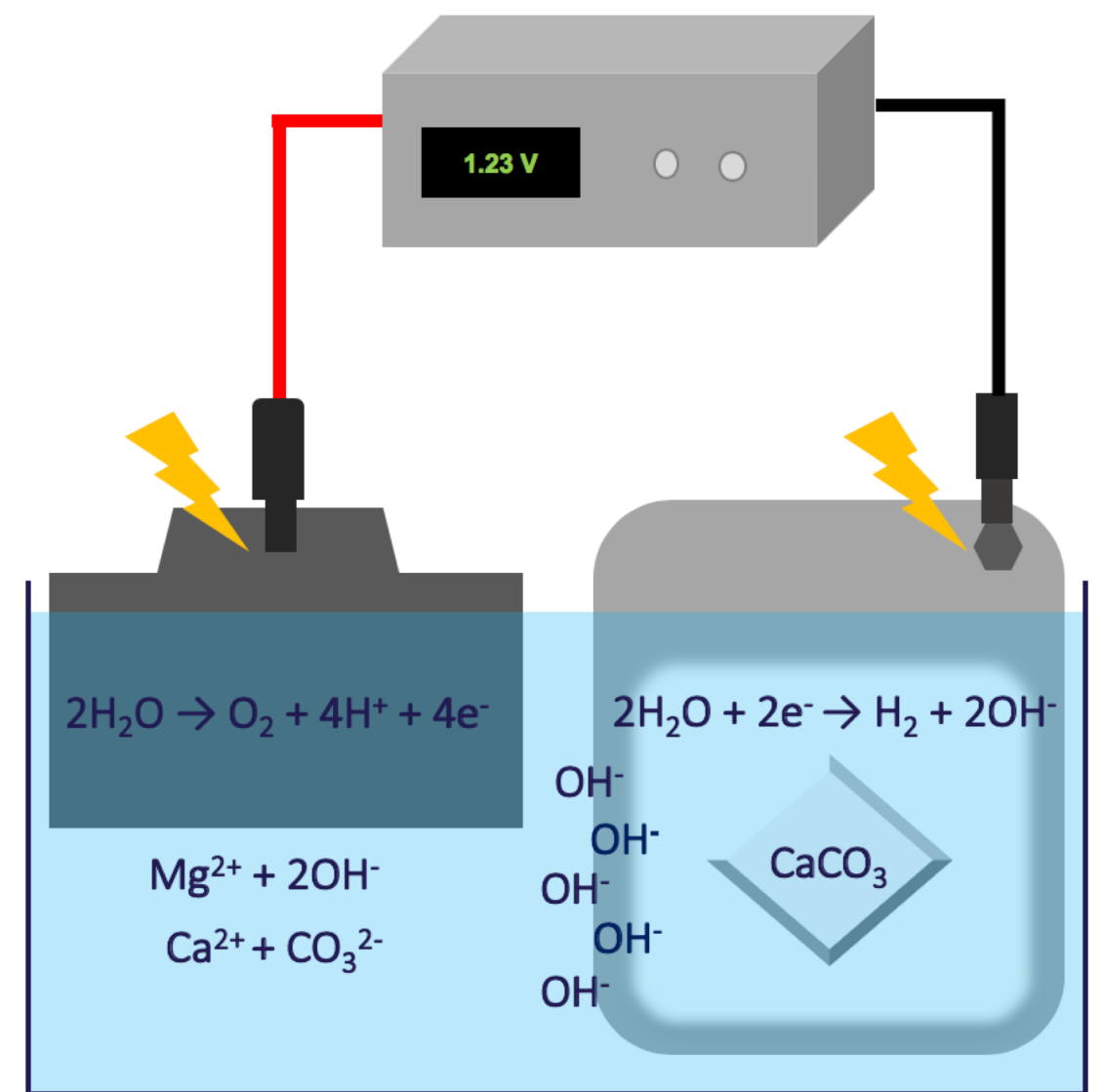
A NEW, INNOVATIVE MATERIAL

The aim of this study is to investigate the applicability of a material made by seawater electrolysis as a subsea **construction material** for green offshore energy structures.



02

BACKGROUND



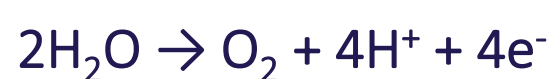
03

METHOD

ELECTROLYSIS OF SEAWATER

The process is based on **electrolysis** of seawater. When immersing a pair of electrodes in seawater and applying a relatively small electric voltage, the water molecules close to the electrodes will be split into hydrogen and oxygen according to the following equations [1]:

Anode reaction



Cathode reaction



MINERAL ACCRETION

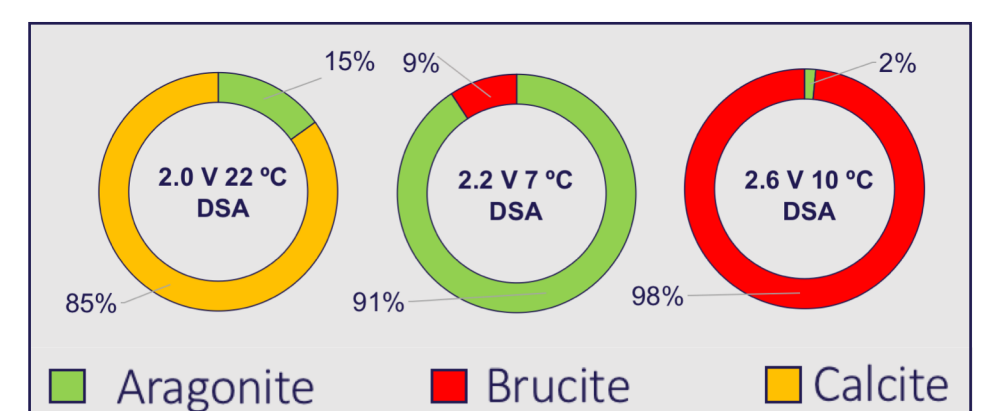
Among the ions dissolved in seawater calcium ions (Ca^{2+}) and carbonate ions (CO_3^{2-}) are of interest for mineral accretion by seawater electrolysis.

Calcium carbonate (CaCO_3) form two polymorphs in seawater, **aragonite** or **calcite** depending on factors like temperature and ion concentrations.

At relatively high voltages a softer material, magnesium hydroxide ($\text{Mg}(\text{OH})_2$, **brucite**) can precipitate [2].

MINERAL COMPOSITION

An initial voltage interval for **electrodeposited** material has been established experimentally, indicating that only a **narrow range** of voltage will result in deposition of CaCO_3 .



REFERENCES

- [1] Goreau. 2012. Marine electrolysis for building materials and environmental restoration. *Electrolysis*, InTech Publishing, Rijeka, Croatia, pp.273-290
- [2] Hilbertz. 1979. Electrodeposition of minerals in sea water: Experiments and applications. *IEEE Journal of Oceanic Engineering*, 4(3), pp.94-113